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Study of the Lakes of Snowdonia and Eastern Carnarvonshire' by T. J. Jehu (*Trans. Roy. Soc. Edinb.*, XL., pt. 2, 1902, 419-467, 8 pl.). Twenty-six pages are given to an account of the lake basins, illustrated by contoured maps and true-scale sections. The lakes are of two kinds: the larger ones lying in the main valleys, the smaller occupying cirques (cwms). After discussing the origin of the lakes, it is concluded that they are relatively subordinate results of the glacial erosion by which the valleys of the Welsh mountains have been strongly scoured. As seems to be generally the case in such regions, the main valleys are preglacial, but now 'the more important valleys are at places over-deepened as compared with the lateral valleys and \* \* \* have a trough-like form with flat bottom and steep cliff-like walls.' Tributary streams often cascade into the main valleys. Cirques, with or without lakes, occur at the valley heads. "If the glaciers have thus \* \* \* eroded the channels along which they flowed, the excavation of rock basins below the general level of the valley floor \* \* \* need no longer excite surprise or be looked upon as anything more than subordinate incidents in the general history of ice erosion."

It is suggested that 'the lakes occupy in their respective valleys just those positions in which the glaciers might be expected to have carried on most actively the work of erosion,' and these positions are said to be next above narrows, presumably due to harder rocks, where the glacier would be retarded in its flow; but this last point seems open to question. The erosion of a lake basin in a valley floor just above a hard-rock narrows would not be inconsistent with a maximum erosion further up the valley where the glacier was thicker, for erosion might depend on the maximum pressure of the ice, rather than on its retardation. The height of hanging lateral valleys should be considered along with the depth of lake basins in determining the places of greatest glacial erosion in main valleys.

W. M. DAVIS.

#### RECENT ZOOPALEONTOLOGY.

##### TRIASSIC ICHTHYOSAURS FROM CALIFORNIA AND NEVADA.

ICHTHYOSAURS are so rare in America and Triassic ichthyosaurs are so rare everywhere, that these discoveries in Nevada and in Shasta County, California, are particularly welcome. Professor John C. Merriam\* describes very fully the *Shastasaurus* of the Upper Triassic of California from considerable portions of seven individuals, together with many isolated bones and teeth representing nearly the whole of the skeleton, but lacking the very important distal portions of the paddles. These remains are placed in six species. From the Middle Triassic of Nevada, the *Cymbospondylus* of Leidy, including three species, is more fully defined and characterized.

##### RELATION OF THE OSTRACODERM AND ARTHRODIRAN FISHES.

DR. OTTO JAEKEL contributes a new discussion† of this group decidedly at variance with the views of Smith Woodward and Dean. He unites the Arthrodira and Ostracodermata, which have been separated by Cope, Smith, Woodward and Dean, into the single order of Placoderms. Among the Ostracoderms he believes that the Pteraspids have retained a larval character, whereas the Asterolepids have become somewhat more specialized. The Coccosteoid arthrodiras including *Coccosteus*, *Dinichthys* and *Titanichthys*, have attained a higher organization, and, owing to their freer motions, have a completely segmented skeleton provided with limbs, which enables us to compare them with other vertebrates. He gives a partial restoration of *Coccosteus*, the chief feature of which is the prominent pelvic girdle, the existence of which has been questioned by Dean. The Coccosteids exhibit parallels with the ancient types of sharks and crossop-

\* 'Triassic Ichthyopterygia from California and Nevada,' University of California Publications, Bulletin of the Department of Geology, Vol. 3, No. 4, pp. 63-108, pls. 5-18.

† 'Coccosteus und die Beurtheilung der Placodermen,' *Gesells. naturf. Freunde zu Berlin*, 20 Mai, 1902.

terygians, with the Chimæroid fishes, and even with the tetrapod Stegocephalia. He concludes that the Placoderms in this larger sense are true fishes, and that among them the Coccosteids occupy an ancestral position, on the one hand to the ancient Ganoids and to the Chimæroids; on the other hand, they show relationships to the Stegocephalia and Amphibia.

These views differ very widely from those recently presented afresh by Patten in the *American Naturalist*, who regards the Ostracoderms, especially as seen in the *Tremataspis* form, as intermediate between crustacea somewhat of *Limulus* type and vertebrates.

#### ORIGIN OF THE TURTLES.

STILL more important is Dr. Jaekel's description of a new Placodont\* from the Upper Triassic, which he names *Placochelys placodonta*, owing to the fact that he believes it constitutes a toothed ancestor or collateral of the turtles. Since *Placodus* and the related form of *Cyamodus* have hitherto been placed by Zittel and others near the Anomodont reptiles, the discovery of an animal which unites the skull of the *Placodus* type with the armored skeleton of the Chelonian type is most interesting. Dollo had already predicted the existence of toothed turtles, and the present reviewer was strongly of the opinion that *Placodus* belonged much nearer the turtles than the Anomodonts. This new animal, *Placochelys*, suggests to the author the ancient Rhynchocephalian *Hyperoadapedon*. The structure of the skull and other parts of the skeleton is not at all like that of the Anomodonts; on the other hand, it is more similar to that of primitive Plesiosaurs such as *Nothosaurus* and *Pistosaurus*. This would confirm Baur's opinion of the strong original relations between Plesiosaurs and Chelonia. The carpus, as well as the skull structure and spread of the ribs, points to resemblances especially to Chelonia of the order Pleurodira.

\* 'Ueber *Placochelys* n. g. und ihre Bedeutung für die Stammesgeschichte der Schildkröten,' Sep.-Abd. a. d. *Neuen Jahrb. f. Min., Geol. u. Pal.*, 1902, Bd. I.

#### ABANDONMENT OF THE OLIGOCENE AND MIOCENE LAKE BASIN THEORY.

HATCHER's recent discussion\* of the origin of the Oligocene and Miocene deposits of the great plains, following the argument strongly presented by Dr. W. D. Matthew in his memoir 'Fossil Mammals of Northeastern Colorado,' appears to give the death blow to the lake basin theory of most of the great deposits east of the Rocky Mountains. The earlier writers, including David Dale Owen, King, Hayden, Leidy, Cope, Marsh and others, were always accustomed to speak of these deposits as lacustrine, and they are at present, or were until very recently, so considered by many authorities, such as Todd, Scott, Dalton. While the Lower Oligocene or White River series are largely composed of river and flood-plain deposits, Mr. Hatcher shows the absence of any evidence of the existence of a great lake. He adds to the observations of Matthew numerous geological and faunal observations of his own, such as the occurrence of shallow water forms of plants and animals, characteristic of small springs, shallow ponds and brooks, remains of forests, and the absence of remains of crocodiles, turtles and fresh-water fishes. He concludes: "The above facts, together with those brought forward by Dr. Matthew, have driven me, contrary to my earlier opinion, to reject the theory of a great lake and accept that of small lakes, flood-plains, river channels and higher grass-covered pampas as the conditions prevailing over this region in Oligocene and Miocene times."

#### STUDIES OF EOCENE MAMMALIA IN THE MARSH COLLECTION, PEABODY MUSEUM.

THE first part of these very interesting and important studies by Dr. J. L. Wortman† have now been published in collected form, making a bulletin of 144 pages, abundantly illustrated with pen drawings, including the description

\* 'Origin of the Oligocene and Miocene Deposits of the Great Plains.' *Proc. Am. Phil. Soc.*, xli., Apr., 1902, p. 113.

† 'Studies of Eocene Mammalia in the Marsh Collection, Peabody Museum, Part I., Carnivora,' *Amer. Jour. of Science*, Vols. XI.-XIV., 1901-1902.

of a large number of new species as well as full and accurate definitions of the species proposed by Professor Marsh, and setting forth a number of original views regarding the relationship of these animals. As regards the larger relationships of the earliest American Carnivora or Creodonts, Wortman believes that they sprang from Metatheria or primitive Marsupials in Huxley's sense, rather than that the Marsupials and primitive Placentals sprang alike from a common marsupio-placental stock, as defined by Osborn. Among the Mesonychidæ especially are found numerous illustrations of the Marsupial relationship, such as evidence of the extreme helplessness of the young at the time of birth. The dogs are clearly carried back into the Eocene, and it is shown that they split up into several series, one type leading to the *Amphicyon* series of Europe and America. A new genus *Oödetes*, is proposed; and the position is taken that the descent of the modern Viverrines is probably traceable to these Eocene types. Similarly the Felidæ, or cats, are provisionally traced back to *Ælurotherium*.

The author rejects the homologies of the dental cusps established by Osborn on Cope's tritubercular theory, concluding as follows: 'The manner of origin of these cusps having been incorrectly determined, it follows that the homologies are wrong, and the names applied inappropriate and misleading.' Even if this statement were supported by subsequent discovery, it would not justify the further conclusion of the author that the names of the cusps 'should, therefore, be abandoned, since they can be productive only of confusion and error in any attempt at further progress in the subjects' (p. 98). Similarly the author rejects Osborn's views regarding the value of the articular facets in determining the position of the feet in the early clawed animals, concluding that the 'planes of the articular facets, as applied to the feet of the Carnivora, have little or no value in determining whether a given animal is plantigrade or digitigrade.'

Altogether this paper is of exceptional value, and the authorities of the Yale Museum are to be congratulated upon its publication. It does full justice to the early observations of

Professor Marsh, which for lack of time were never amplified. Attention may again be directed to the extreme importance of inserting museum catalogue numbers of the fossils in connection with all figures and descriptions, especially because this purports to be a more or less final revision of the material.

#### A NEW PLEISTOCENE RHINOCEROS RELATED TO THE SUMATRAN FORM.

DR. FRANZ TOULA, of Vienna, gives a very full description\* of a new species of rhinoceros (*R. hundsheimensis*) found in Austria in 1900, and very closely related to the Sumatran rhinoceroses. Unfortunately the diagnostic anterior portion of the nasal bones is wanting. An especially valuable feature of the memoir is a comparison of a very large series of skulls of the Sumatran rhinoceros, showing the extreme variability in the shape of the anterior horn and in the development of its bony supports; also the variations of the occiput, and of the teeth. The author concludes that this species undoubtedly belongs in the series (subfamily Ceratorhinæ Osborn) including *R. etruscus*, *R. megarhinus* and *R. schleiermacheri*. These rhinoceroses are characterized by long skulls, somewhat elongate limbs, and a pair of widely separated horns on the nasals and frontals. This is further confirmation of the polyphyletic character of the Perissodactyles in general.

#### RELATIONS OF OKAPIA.

DR. E. RAY LANKESTER has recently completed his memoir† on *Okapia*, giving the history of the discovery, an account of the region it occupies, a complete description of the skull and jaws and of the characters presented by the skin and notes on the nature and origin of horns in the Pecora. The memoir is illustrated by three beautiful plates. He concludes that the genus may be characterized as a member of the Giraffidæ,

\* 'Das Nashorn von Hundsheim,' *Abd. d. K. K. Geol. Reichs.*, Bd. XIX., Heft 1, Vienna, April, 1902.

† 'On *Okapia*, a new Genus of Giraffidæ, from Central Africa,' *Trans. Zool. Soc. of London*, Vol. XVI., Pt. VI., August, 1902.

but contrasted with (*a*) *Giraffa*, by its pair of supraorbital or frontal horn-bosses, which in *Giraffa* are parietal instead of frontal, and with (*b*) *Helladotherium*, in which there are no paired horn-bosses. It is closely related to *Samotherium*, especially in the presence of these suprafrontal ossicusp (conical bony horns). Dr. Forsyth Major, of the British Museum, is making an examination of these rudimentary or possibly vestigial horns in regard to their bearing on the whole question of the origin of horns. H. F. O.

FIELD WORK IN VERTEBRATE PALEONTOLOGY AT THE CARNEGIE MUSEUM FOR 1902.

THROUGH the continued generosity of Mr. Carnegie, the founder of this institution, the Department of Vertebrate Paleontology has been enabled to continue the work of exploration in the fossil fields of the West, which was undertaken some three years ago and the prosecution of which has been attended throughout with almost phenomenal success.

Early in the season the present writer, under whose direction the work has been carried on, planned and organized four parties for exploration. One of these, under Mr. O. A. Peterson, was sent first into the White River Tertiaries of Sioux County, Neb., and later into the adjacent Laramie deposits of Converse County, Wy. In the White River beds the party under Mr. Peterson secured, among other material, five Titanotheres skulls, a considerable portion of the skeleton of *Elotherium*, and material which it is thought will be sufficient to mount the skeletons of *Hyracodon* and *Hoplophoneus*. In the Laramie portions of the skulls and skeletons of both *Triceratops* and *Dryptosaurus* were secured.

Mr. C. W. Gilmore was returned to southern Wyoming to continue the work commenced in that region in the season of 1899 by Dr. J. L. Wortman, and since carried on with such splendid results by Mr. O. A. Peterson in 1900 and Mr. Gilmore in 1901. The bone quarries on Sheep Creek were worked until about the middle of the season, when they were abandoned and a new quarry opened

up in the Freeze Out Mountains. From this, valuable collections, especially of the remains of *Morosaurus* and some of the carnivorous forms of Jurassic Dinosaurs, were recovered.

Mr. W. H. Utterback was sent to explore the Mesozoic deposits about the slopes of the Big Horn Mountains in Wyoming. He was successful in discovering, in the Jurassic deposits on Powder River, the skeleton of a Sauropod dinosaur in which the bones are in an excellent state of preservation and which, moreover, gives promise of being the most perfect skeleton of any member of the Sauropoda yet discovered.

Mr. Earl Douglass undertook an exploration of the various Tertiary horizons and localities recently discovered by him in Montana and reports most gratifying results, having secured more than fifty skulls of Tertiary mammals, many of them associated with considerable portions of the skeleton. Mr. Douglass was also fortunate in discovering in one locality, in beds belonging to the White River formation, a horizon where fossil fishes were both abundant and well preserved.

J. B. HATCHER,  
*Curator of Vertebrate Paleontology, Carnegie Museum.*

INAUGURATION OF CHANCELLOR FRANK STRONG AT THE UNIVERSITY OF KANSAS.

For the Inauguration Exercises of the new Chancellor at the University of Kansas, three days, October 16, 17 and 18, were set apart. This was a notable event in the history of education in the middle west. On Thursday, October 16, occurred the dedication of the chemistry building, recently completed. The dedicatory exercises were under the auspices of the Kansas City Section of the American Chemical Society. The following papers were read and discussed: 'The New Reaction of the Formamidines,' by Professor F. B. Dains of Washburn College, and 'Ionic Velocities in Liquid Ammonia,' by Professor E. C. Franklin, of the University. In the evening a large audience assembled to listen to the formal dedicatory address by Dr. Harvey W. Wiley, Chief of the Bureau of Chemistry, De-